SECTION 4
ECOLOGICAL SETTING

The Chihuahuan Desert is subdivided into three regions: the northern Trans-Pecos region, the middle Mapimian region, and the southern Saladan region (MacMahon 1988). The RGCP is located in the northern Trans-Pecos region of the Chihuahuan Desert.

The Trans-Pecos region of the Chihuahuan Desert is historically a mosaic of grasslands and desert shrub lands (Burgess 1995; McClaran 1995). Tobosa, black grama, and other grass species dominate the grassland communities. Desert shrub species are primarily creosote bush or tarbush. Riparian vegetation is dominated by willows, cottonwood, and mesquites with contributing species including ash and desert willow. Recently, invasive salt cedars have attained dominance in the majority of riparian communities.

Within the Trans-Pecos ecological region, most of the Rio Grande floodplain is used as irrigated farmland. Cultivated areas are leveled and commonly graded into benches. The floodplain was formerly subject to flooding from the river but is now well protected outside the USIBWC levees.

4.1 CLIMATE

Humidity is generally low, with cool winters and hot, dry summers. For El Paso, Doña Ana, and Sierra Counties, the average daily maximum temperature in July is 95ºF, while the average daily minimum temperature in January is 30ºF. The area receives an average of 8 inches of rain annually. Rainfall is heaviest July through September, and occurs mostly in intense thunderstorms which can cause local flooding and soil erosion from levee slopes and river banks. The average length of the growing season (frost-free period) is 248 days (U.S. Department of Agriculture [USDA] 1971).

4.2 SOILS AND GEOLOGY

Intermontane sediments known locally as bolson deposits underlie most of the RGCP. These sediments washed down from nearby mountains and filled the basin formed during the uplift of the mountains and the faulting that occurred in the Tertiary period and continued into the Quaternary. The basin in El Paso County, known as the Hueco Bolson, was enclosed at first but was later drained when the Rio Grande made its present course. Since then, water from precipitation and runoff has leached the carbonates from the parent material and formed layers of caliche at various depths below the surface (USDA 1971).

Soils on the floodplain of the Rio Grande formed in alluvium recently deposited by the river. At the landscape level, the NRCS (USDA 1971) characterizes these floodplain soils as the Harkey-Glendale Association. This association is made up of deep, nearly level calcareous soils. Surface soils are typically silty clay loams over stratified layers of loamy soils and fine sand. Locally, the RGCP soils are classified as Made land, Gila soil material. This series consists of soil materials, chiefly from Gila soils, which are silty clay loam, fine

sandy loam, and sand in texture. The soil is made of recently deposited alluvial material, which has been moved and shaped for construction of levees and for relocation and straightening of the river channel.

4.3 HYDROLOGY

The flow of the Rio Grande originates from watersheds in the southern slopes of the Colorado mountains and the mountain ranges of northern New Mexico. This water is stored at Elephant Butte and Caballo Reservoirs. The water is used to irrigate the Mesilla, El Paso, and Juarez Valleys.

The water released from Elephant Butte Reservoir has averaged 682,000 acre-feet annually. A large portion of this flow (~495,000 acre-feet) is diverted annually to irrigate croplands in New Mexico. The remainder and return flow then reach El Paso at an annual rate of 443,000 acre-feet. As the flow reaches American Diversion Dam, 269,000 acre-feet are diverted annually to the American Canal, which is the main supply canal for the El Paso Valley. The diversion to Mexico has amounted to 60,000 acre-feet annually which is used to irrigate the Juarez Valley in accordance with the 1906 Convention.

The Elephant Butte Reservoir operations are based on average historic losses and evaporation rates for Elephant Butte and Caballo Reservoirs. Scheduled outflow from Elephant Butte and Caballo are based on average irrigation demands for years with a full water supply.

4.4 VEGETATION

4.4.1 Historic Vegetation

When the Spanish arrived in the 16th century, the bank, sand bars, and adjacent floodplain areas of the Rio Grande were vegetated with scattered bosques of varying-age valley cottonwood, with a willow and salt grass dominated understory (Scurlock 1998). Open, grassy areas, or vegas, were also present. Cattails and other wetland species grew in and around ponds, marshes, and swampy sites. Other major plants associated with bosques included New Mexico olive, baccharis, false indigo bush, wolfberry, and in southern reaches, mesquite. All these plant communities were considerably modified by human activity during the historic period (Crawford *et al*. 1996, and Dick-Peddie 1993). Fossil evidence traces the bosque community back 2 million years. Bosques were dynamic, growing and spreading when weather was favorable, and dying off during periods of prolonged drought or prolonged floods. The communities ranged from old growth to pioneer species, and provided varied and diverse habitat for native wildlife (Crawford *et al.* 1996).

Wetlands were abundant in the Rio Grande floodplain, evidence of a shallow water table and dynamic shifting river (Stotz 2000). The early Spanish explorers throughout El Paso and Mesilla valleys observed numerous oxbows and pools. The wetlands provided habitat and refuge for wildlife during the low flows of the river.

Numerous floods resulting in a highly variable river channel characterized the flow regime. Snowmelt, widespread summer rains, and localized heavy thunderstorms caused floods (Scurlock 1998). The river course frequently changed, meandering throughout the valley. Minor lateral shifts were frequent and even large-scale changes in the channel occurred. Channel width varied considerably, historical reports described the river width ranging from 600 feet wide to virtually a trickle among sandbars (Stotz 2000).

The current dominance of invasive, exotic vegetation such as salt cedar and subsequent decline of species characteristic of historic bosques is in response to anthropomorphic factors including altered hydrology and land use changes among others (Everitt 1998; DeBano and Schmidt 1989; Schmidly and Ditton 1978).

4.4.2 Invasive Species

Salt Cedar

Several species of salt cedar were introduced into the United States from southern Europe and the eastern Mediterranean region in the late 1800s. Many of these species escaped cultivation, and spread rapidly throughout the riparian areas of the southwest. Salt cedar has several characteristics that make it well suited to the desert regions of the southwest.

Salt cedar is considered a facultative phreatophyte able to survive in conditions where groundwater is depleted and the soil is unsaturated (DiTomaso 1998). Salt cedar can survive drought conditions longer than cottonwoods and willows, and can then rapidly respond to the presence of water (Devitt *et al*. 1997) and may desiccate watercourses (Vitousek 1990; DiTomaso 1998). In addition to the ability of salt cedar to tolerate drought and saline conditions, there is some evidence that the fire regime of these riparian areas may be altered by the presence of salt cedar (Bock and Bock 1990; Smith *et al*. 1998). Salt cedar is relatively tolerant of fire, while most native riparian species are not.

Salt cedar is the dominant woody species found in the riparian and wetland vegetation communities of the RGCP. It would likely dominate the majority of the floodplain replacing herbaceous communities if mowing ceased. Salt cedar tends to release seeds later in the season than cottonwood or willow, starting about the middle of July (Gladwin and Roelle 1998), but salt cedar release seeds for a much longer period of time (up to 5 months) and the seeds are viable for up to 3 months after release (USBR 2000). Salt cedar requires bare moist soil for germination, similar to the conditions required by cottonwood and willow. However, the longer period of release provides salt cedar with the ability to germinate later in the season when water flows are declining, including after late summer monsoonal rains (USBR 2000).

Salt cedar removal is a labor intensive process often requiring a combination of mechanical, manual and chemical treatments (Sudbrock 1993). Seasonal, long-term flooding can be a successful alternative when the salt cedar seedlings are small and they can be completely inundated (Gladwin and Roelle 1998).

Russian Olive

The Russian olive has also become established within many riparian areas of the southwest. Russian olive was introduced into the United States in the late 1800s, and subsequently escaped cultivation (Olson and Knopf 1986). Russian olive is a rapidly growing plant with a deep taproot and extensive lateral branching (Borell 1971). The Russian olive can effectively compete with native species for space and water, and is a superior competitor on bare mineral substrates due to nitrogen fixing root nodules (Plant Conservation Alliance 1997). Russian olive is considered relatively salt tolerant, although not as salt tolerant as salt cedar (Olson and Knopf 1986; Vines 1960), and is often found as a co-dominant species with willow. It is generally considered inferior wildlife habitat to native riparian species (Olson and Knopf 1986).

Russian olive is most prevalent in the northern reaches of the RGCP. Generally, the easiest way to control Russian olive is with a regime of mowing and removing the cut material. However, the seeds of the Russian olive are readily dispersed by many birds, so if mowing were reduced in some areas, this plant may become more abundant.

Russian Thistle

Russian thistle, also known as tumbleweed, was introduced into the United States in the late 1800s. It has colonized extensive areas within the RGCP, particularly in disturbed sites in response to grazing and mowing. The seeds of Russian thistle are dispersed when the plant dries and wind tumbles the dried plant to a new location. Russian thistle is a particular problem in agricultural areas because of its extensive seed bank and water use. Research in croplands indicates that Russian thistle may be able to extract water from deep in the soil profile (Schillinger and Young 1999), potentially lowering the water table.

Control of Russian thistle is primarily through chemical controls and occasionally with mechanical controls (*e.g.,* tilling). Chemical control is preferred because of the seed bank that is often exposed when mechanical control methods are used.

Current Vegetation

Vegetation in the RGCP area are primarily disturbance-type communities, generally dominated by invasive exotic plant species. Species composition in these communities is related to river proximity. A border of hydrophytic vegetation, generally 10-15 feet wide, occurs on the river bank forming the sloped side of the channel. This narrow riparian zone is dominated by salt cedar with occasional seep willow, willow, or herbaceous vegetation, including common reed, sedges, and rushes. Isolated wetlands are found along the river channel, spillways, and low-lying areas within the floodplain. Salt grass is the common grass occurring in wetland sites.

Riparian Communities

There has been limited research conducted about the riparian communities in the RGCP (Watts 1998). As a result, Parsons (2001b) conducted field studies to document vegetation and habitat quality of the RGCP. Field studies found that periodic mowing maintains a large portion of the riparian community in disturbed, or early serial state characterized by herbaceous vegetation and shrubland re-growth. Riparian areas not mowed or otherwise maintained rapidly become dominated by non-native salt cedar. The control of woody vegetation through mowing is a major O&M activity within the floodway and is conducted to reduce woody vegetation for flood control and water delivery purposes.

The majority of the RGCP floodway is rarely flooded and disassociated from the river channel. Natural channel characteristics formed through periodic flooding and high velocity flows are largely absent. The widespread absence of young and mid-aged cottonwood within the RGCP (Parsons 2001b) suggests that the irrigation driven hydrologic regime has greatly influenced riparian native species composition.

In terms of native cottonwood regeneration, there is little evidence of new cottonwood establishment among the scattered and declining cottonwood remnants. Natural propagation appears to be limited to isolated, new growth trees propagated through root suckers with little successful seed germination observed (Parsons 2001b).

4.5 WETLANDS

Wetlands have undergone considerable modification in recent history. Wetlands were found throughout the Rio Grande floodplain created by a dynamic river system responding to heavy snow melts or storm generated runoff. The presence of abundant and mosaic wetlands interspersed among riparian vegetation was driven by seasonal rain and basin hydrology (Crawford *et al*. 1996). By some accounts, wetlands extent increased in response to widespread land use changes, which modified river hydrology, raised water tables and created saturated soil conditions (Wozniak 1995).

As recently as the early 1900s, high water tables in the floodplain created many wet meadows, marshes, and ponds providing habitat for wildlife and subsequently reducing its value as cropland. In response to saturated soil conditions, extensive drainage canals were built in the 1920s to remove water and improve agricultural productivity. The drainage eliminated the majority of wetlands by the 1930s thereby increasing the importance of the remaining wetlands found among the irrigation network and river margin (Wozniak 1995).

Within the RGCP, wetlands are largely restricted to narrow margins and former oxbows within the floodway. High water tables during irrigation season have created pockets of emergent marsh and wet meadow sites within the floodway and on private lands adjacent to the ROW (Parsons 2001b). The two most significant wetlands on private lands adjacent to the ROW are found north of Seldon canyon and south of Las Cruces.

4.6 VEGETATION COMMUNITY CLASSIFICATION

Vegetation communities are classified as either riparian (the floodway) or upland vegetation. Riparian is generally defined as land occurring along a water body (Briggs 1996) transitioning between permanently saturated wetlands and upland areas (BLM 1993). Older and more classical riparian interpretations identify primarily woody vegetation associated only with stream or river systems. Recent interpretations include a broader view involving, surface and subsurface water influences, and natural forces and human-induced activities that affect woody and emergent vegetation (Dall *et al.* 1997). For classification purposes, lands within the floodway (including wetlands) are classified as riparian with the wetter areas classified as wetlands. Within each riparian and upland class, more detailed physiognomic classes are defined. Table 4.1 presents vegetation community classification used to describe the RGCP.

4.6.1 Riparian Communities

Herbaceous. Due to mowing, much of the riparian community is maintained in an early successional state and classified as herbaceous. Herbaceous communities include non-woody vegetation such as grasses, sedges, and forbs with less than 20 percent cover in trees and shrubs. This community corresponds to Hink and Ohmart Type VI open grassland or emergent community. Although the herbaceous community is diverse, many non-native, invasive, and noxious species such as Russian thistle, red bladderpod, and jimson-weed occur. Many plants are opportunistic, early successional species which are often indicators of disturbance. With the exception of Seldon Canyon, the herbaceous class is abundant throughout the RGCP.

Table 4.1 Vegetation Communities and Aquatic Habitat within the RGCP

VEGETATION COMMUNITY	UPPER RINCON	LOWER RINCON	SELDON CANYON	UPPER MESILLA	LAS CRUCES	LOWER MESILLA	EL PASO	TOTALS
Riparian (floodway)								
Herbaceous	303	542	14	289	459	399	555	2551
Herbaceous – on levees	46	154		46	131	217	154	748
Woodland	380	196	8	242	195	264	160	1,445
Shrubland	302	305	4	117	38	49	24	839
Exposed ground	276	101	0	138	36	111	40	702
Croplands	40	26	0	0	0	0	0	66
Wetlands - Emergent marsh	42	31	2	15	11	29	10	140
Wetlands – Palustrine Woodland	12	20	0	0	3	1	1	37
Total Riparian (acres)	*1,401*	*1,375*	*28*	*836*	*873*	*1,070*	*944*	*6,527*
Uplands								
Herbaceous	789	83	0	0	0	0	0	872
Woodland /Shrubland	721	51	0	0	0	0	0	772
Exposed ground	131	30	0	0	0	0	0	161
Total Upland (acres)	*1,641*	*164*	*0*	*0*	*0*	*0*	*0*	*1,805*
Total Land Acreage	**3,042**	**1,539**	**28**	**836**	**873**	**1,070**	**944**	**8,332**
Open Water/Unconsolidated Shore	271	541	263	292	420	498	445	2730
Total Acreage for the RGCP	**3,313**	**2,080**	**291**	**1,128**	**1,293**	**5,168**	**989**	**11,062**

Within the floodway, herbaceous lands are normally characterized as intermediate to xeric grasslands. Xeric grasslands are located on the levees and higher sites within the floodway. Approximately 748 acres of grasslands are part of the levee. Isolated lower sites are composed of mesic vegetation at times transitioning into hydric (wetland) communities. In the absence of mowing, herbaceous areas would likely convert to a woody salt cedar community.

Woodlands. Woodlands are dominated by woody vegetation over 9 feet tall and with a minimum canopy cover of 20 percent. This community corresponds to Hink and Ohmart Type III woodland, and is also referred to in this document as bosques. Woodlands consist of native and non-native woody species, with native species rarely dominating. The dominant species in this community is invasive salt cedar. Common native species include honey mesquite, littleleaf sumac, peachleaf willow, and occasional Rio Grande cottonwood.

Shrublands. Shrublands are characterized by woody vegetation less than 9 feet with a canopy cover less than 20 percent. This community corresponds to Hink and Ohmart Type V dense shrub community. Within the RGCP, the dominant species in the shrubland is salt cedar. The shrubland class is similar in species composition of the woodland community. Native species in this class include apache plume, aromatic sumac, baccharis, fourwing saltbush, and pale wolfberry. Shrublands dominated by willow/seepwillow often transition into palustrine wetlands. Due to the changes in vegetation as a result of the mowing there is a significant overlap between shrubland and herbaceous communities. Permanent shrubland habitat is found closer to the river or in other areas more difficult to mow.

Exposed Ground. This land cover classification is characterized by the absence of vegetation and includes bare soil, sand, silt, and gravel and vegetation, if present, is very sparse. Bar ground accounts for a significant amount of the floodway. A recent study in the RGCP using a transect sampling method found that in over half of survey sites (18 of 35 sites), bare ground was actually the dominant land cover type and in 11 sites, it was the second most dominant land cover type (Watts 1998).

Cropland. Croplands include alfalfa, chili, corn, cotton, pecan and a number of other crops. These agricultural areas make up a small percentage of the land cover within the floodway.

Wetlands. Wetlands are those areas where water saturation is the dominant factor determining soil development and the types of plants and animal communities present (Cowardin *et al.* 1979). Wetlands are found on sandbars near the center of the channel, river margins or in close proximity to the mouths of arroyos (Parsons 2001a). Wetlands are also found in the floodway where groundwater is at or just below the surface. These wetlands are classified as palustrine woodlands or emergent marsh.

- **Emergent Marsh.** The emergent marsh class is dominated by herbaceous vegetation such as bulrush, cattail, and horsetail. Non-native, or noxious species include Johnsongrass, downy brome, and careless weed. Hydrology is a function of rainfall, episodic flooding, and depth of water table. The majority of wetlands

in the RGCP are classed as emergent marsh. Emergent marshes are primarily found in the Upper Rincon, Lower Rincon and Lower Mesilla RMUs. Two fairly significant emergent marsh areas are located on private property north of Seldon Canyon and south of Las Cruces. Both areas are within potential conservation easements.

- **Palustrine Woodlands.** Palustrine woodlands are dominated by facultative to obligate woody wetland vegetation. The class is characterized by mixtures of native and non-native plant species found in moist soil conditions. Willow/seepwillow cover types found in saturated soil conditions fall within this category. Depending on hydrologic regime, cottonwood bosques can be classified as palustrine woodlands or riparian woodland. Palustrine woodlands characterized by native species are rare, and when found, occur as narrow isolated pockets. The majority of native dominated palustrine woodland sites are found in the Upper Rincon RMU. Palustrine woodlands can include species such as New Mexico olive, baccharis, false indigo bush, and wolfberry (Scurlock 1998).

4.6.2 Uplands

The uplands represent lands outside the historic floodplain and are dominated by xeric plant species. Grazing in the uplands has reduced populations of some grasses, and the grass communities with grazing tolerant forbs and shrubs. These communities include less palatable species such as snakeweed and shrubs such as saltbush and salt cedar (Scurlock 1998; Stotz 2000).

Woodland/shrubland. The woodland/shrubland community includes non-agricultural trees but will occasionally include drier former agricultural lands dominated by woody vegetation (over 20 percent woody coverage). Shrublands are mostly less than 9 feet in height and over 20 percent canopy cover. The majority of the woody upland sites are shrubland class.

Herbaceous. Herbaceous lands include all non-woody vegetation including grasses and forbs. Herbaceous areas are composed of less than 20 percent woody cover. Recent studies of upland vegetation suggest that ground coverage is often less then 20 percent within this and other uplands classes (USACE 1996).

Exposed Ground. Exposed lands are relatively abundant in the northern reach of the RGCP and include bare soil, sand, silt, and gravel. This land cover classification is defined by the absence of vegetation (<5 percent coverage). Vegetation, if present, is sparser than in vegetated land use classes. Exposed ground is often interspersed within herbaceous and woodlands.

4.7 REFERENCE COMMUNITIES

Reference Communities represent the desired future condition of vegetation communities as a result of implementing environmental measures. The actual process of developing

desired future communities is dependent on site-specific characteristic and monitoring to achieve success. Table 4.2 lists potential reference communities created as a result of implementing environmental measures. Table 4.3 presents the total acreage of each reference community by alternative. The following section describes each of the four reference communities.

Table 4.2 Reference Communities Associated with Environmental Measures

ENVIRONMENTAL MEASURE	ALTERNATIVE*	REFERENCE COMMUNITY
Modified grazing leases (uplands)	FCI, IULM, TRR	Improved uplands
Modified grazing leases (riparian zone)	FCI, IULM, TRR	Improved riparian
Modified grassland management	IULM, TRR	Native grasslands
Native vegetation planting	IULM, TRR	Native bosque
Existing bosque enhancement	IULM, TRR	Native bosque
Bank shavedowns	IULM	Native bosque
Seasonal peak flows/bank preparation	TRR	Native bosque
Reopening former meanders within ROW	TRR	Native bosque
Conservation easements	TRR	Native bosque, native grasslands and/or remnant bosques

* FCI, Flood Control Improvement; IULM, Integrated USIBWC Land Management; TRR, Targeted River Restoration

Table 4.3 Reference Communities by Alternative

EVALUATION CRITERIA	NO ACTION	FLOOD CONTROL IMPROVEMENT	INTEGRATED USIBWC LAND MANAGEMENT	TARGETED RIVER RESTORATION
Improved Uplands (acres)	NC	1805	1805	1805
Improved Riparian (acres)	NC	1747	1747	1688
Native Bosque or Cottonwood/Willow riparian community (acres)	NC	NC	350	1549
Native Grasslands (acres)	NC	NC	1641	1929

nc=no change

Improved Riparian Community. This community would be developed through modification of floodway grazing lease practices in conjunction with additional salt cedar control methods. Although the primary objective is improved erosion control and bank stability in grazed areas, the improved riparian community would incorporate livestock grazing in a manner more compatible with biological quality, and increase forage production. It would develop habitat corridors between patches of bosque, provide increased protection of floodway wetlands, contain the expansion of existing large stands of non-native vegetation, and enhance wildlife habitat. Grazing would be managed to promote regeneration of native vegetation and increase species diversity. Grazing management could include vegetation treatments such as burning, mechanically clearing and re-seeding.

Despite the improved habitat quality, the reference community would continue to be disconnected from the river, composed primarily of herbaceous vegetation with woodlands dominated by invasive species. However, the herbaceous vegetation would be structurally

and floristically diverse. Salt cedar would be controlled to limit the expansion of existing non-native bosque vegetation. Vegetation along the river and in wetlands locations would be maintained in a manner that improves bank stability and decreases potentially sedimentation.

Improved Uplands Community. This community would be developed through modification of upland grazing lease practices and incorporate grazing practices in a manner more compatible with increasing vegetative cover to reduce soil erosion and enhance wildlife habitat. The reference community would be dominated by upland herbaceous vegetation with a percent cover equal to or greater than 40 percent. Leases would be managed to increase the amount of palatable grass species such as grama grass species and other bunch grasses. Modified grazing regimes in conjunction with woody vegetation management will result in a greater contribution of less grazing tolerant grass species, more ground cover and improved soil stabilization.

Native Grassland Communities. Grasses have the greatest potential for holding soils, thus decreasing erosion. Coupled with densely wooded patches the habitat is ideally suited for a number of small mammal and bird species (USACE 2003). Native grasslands would be developed to improve habitat corridors between patches of bosque, provide increased protection of riparian wetlands, and enhance wildlife habitat. However, this reference community would continue to be disconnected from the river, and would be composed primarily of intermediate and xeric native grasses and other herbaceous vegetation. Within isolated mesic and hydric areas, species would include salt grass, cattail, sedges, and rushes.

Grasslands would be established by plantings and maintained through woody vegetation control. A woody component would likely be present, but typically less then a 20 percent aerial coverage. Where appropriate, woody vegetation would be retained for structural diversity and would include native woody vegetation such as screw bean mesquite. More xeric species would become established on higher sites. Salt cedar would be controlled. Vegetation along the river and in wetlands locations would not be maintained, with the exception of salt cedar removal to improve bank stability and decrease potential erosion and sedimentation.

Prescribed burning of grassland may be warranted to improve grass production. Most grasses are relatively tolerant of fire, and the subsequent nutrient pulse will allow grasses to rapidly recover after a fire. If native grasses are well-established, burning will control most woody plants (if they are small) and will promote growth of most herbaceous plants. In addition, if native plants are well established, particularly in the rooting zone, burning will not harm the roots and the soil will remain stabilized (Scurlock 1998; Crawford *et al*. 1996).

Native Bosque Community. Developing and sustaining native bosque communities could include clearing, hydrologic modifications, planting/natural regeneration, salt cedar control, fuel reduction, and natural or induced flooding (USACE 2003). This reference community would be floristically and structurally similar to native riparian communities characterized by uneven aged, multi strata woody plants, with interspersed grasslands and isolated wetlands. This would lead to an increase in valuable wildlife habitat, such as edge areas and patches. The community would be considered hydrologically connected, with the

potential for overbank flows and long term sustainability. Exotic vegetation, particularly salt cedar, would compose less than 20 percent of the community. Dominant woody species would include cottonwood and willow, with other species occurring such as western chokeberry, New Mexico olive, false indigo bush, and wolfberry among others.

Development of this community would require considerable site preparation, and long-term exotic species control. Periodic reduction in fuel loads may be required. Fuel load reduction consists of removing dead and fallen trees and excess leaf litter. When the flood disturbance regime was still functional, much of this material would have been removed by periodic flooding (USACE 2003).

4.8 VEGETATION MANAGEMENT WITHIN THE RGCP

Vegetation management affects the floristic and structural characteristics of vegetation communities. Vegetation management is conducted to reduce the amount of vegetation and potential obstructions within the ROW. The USIBWC manages the floodway vegetation primarily by mowing and grazing. Table 4.4 presents vegetation management by habitat type.

Table 4.4 Vegetation Management Within the ROW

		HABITAT TYPE		
CURRENT VEGETATION MANAGEMENT	ENTIRE PROJECT	WETLANDS*	RIPARIAN (EXCLUDING WETLANDS)	UPLANDS
No Mow Zones	57	0	57	0
Crop Leases	66	0	66	0
Annual Mowing	4,657	124	4,533	0
Grazing Leases	3,552	53	1,694	1,805

* Boundaries of grazing and mowing zones are not clearly delineated; therefore wetland area was proportionally assigned to vegetation management type.

4.8.1 Leased Areas

Grazing Leases. Grazing allotments are leased to private ranchers, and most of the grazing animals on these allotments are cattle. Agricultural and grazing leases require that brush and vegetation be removed or mowed annually within portions of the lease. Additionally, no permanent structures may be constructed. Table 4.5 lists the acreage leased by RMU (USIBWC 2000a).

Crop Easements. An estimated 66 acres of floodway are leased for crop production in the Rincon Valley. The majority of the land is in row crops; however, pecans are grown in the Lower Rincon Valley within the east floodway.

Table 4.5 Acreage Leased in the RGCP

RMU	HABITAT TYPE	LEASED AREA (ACRES)
Upper Rincon	Upland and Riparian	1,911
Lower Rincon	Upland and Riparian	473
Upper Mesilla Valley	Riparian	638
Las Cruces	Riparian	136
Lower Mesilla Valley	Riparian	256
El Paso	Riparian	138
Total Area Leased	***Upland and Riparian***	***3,552***

4.8.2 Mowed Areas

Annual Mowing of Floodway. Mowing of the riparian zone controls weed, brush, and tree growth, and is conducted at least once each year prior to July 15. Farm tractors with rotary slope mowers are generally used to mow the floodways. Slope mowers are used for vegetation maintenance on the channel banks. Some areas with dense vegetation may require a second late summer mowing. Approximately 4,657 acres are potentially mowed within the floodway (Table 4.6). However, the actual area mowed is less because some areas within the ROW are either inaccessible or heavily wooded Based on field observations conducted during the mowing season, mowers frequently work around well-established woodland patches in designated mow area and have been directed to avoid some native stands. The actual acreage cut by Slope mowers, is estimated at 80 percent of the potential area mowed or approximately 3,725 acres.

No-Mow Zones. Approximately 57 acres of no mow zones are located in the Upper Rincon and Las Cruces RMU. Since 1999 the USIBWC has conducted limited tree planting and maintained provisional test areas ("no-mow" zones) intended to evaluate effects of additional vegetation growth on RGCP functions.

Table 4.6 Vegetation Management by Mowing

METHOD	ACREAGE	COMMENTS
Grazing Leases	1,747	Based on a review of aerial imagery, potentially 30% of leased riparian areas are woodlands dominated by salt cedar. As such, active salt cedar control is estimated at 1,222 acres of floodway by lease holders. The remaining areas are grazed woodlands.
Mowing	4,657	Based on a review of aerial imagery, potentially 20% of mowed areas are woodlands mostly dominated by salt cedar. As such, mowing for the purpose of salt cedar control is estimated at approximately 3,725 acres of floodway. The remaining areas are unmanaged woodlands or areas otherwise avoided due to lack of accessibility or protection for designated areas.

4.9 AQUATIC COMMUNITIES

4.9.1 Historic Aquatic System

The earliest recorded accounts of the abundance and types of fish were made by Spanish explorers around El Paso, Texas (Stotz 2000). Early Spanish explorers noted the quantities of fish and eels in the Rio Grande. In 1846 large fish and eels were still being reported as quite common in the river near El Paso (Ruxton 1973). A more specific account of the fish in the El Paso area comes from a 1773 description of life in El Paso: "…the river abounds in fish, known as rok fish, although some call it bream. Other delicious kinds are the corazon and the enguila, all of more than medium size. The enguilas [eels] are found more often in the ponds formed by the overflow of the river than in its channel." Within the waters of the Rio Grande fish and fresh-water turtles were common and utilized as food sources

4.9.2 Current Aquatic Communities

A total 2,730 acres of open water/unconsolidated shore (depending on flow regimes) are found within the RGCP (Table 4.1). Instream habitat is characterized as low diversity lotic habitat with very little pool/riffle structure (optimal aquatic habitat). The vast majority of the river is considered as an undifferentiated run. Instream cover, which provides essential habitat for different life stages of invertebrate and vertebrate life, is practically non-existent. The river channel is mostly straight with little to no sinuosity except in the upper reaches of the RGCP; hence, there is little variation in velocity. Sand and silt dominate the substrate and are generally the least favorable substrates for supporting aquatic organisms and support the fewest species and individuals. The riverbank is moderately stable to unstable.

Aquatic ecosystems are influenced by upland and floodplain-riparian vegetation. Vegetation composition will influence and is influenced by the prevailing hydrological regime. The floodplain is dominated by herb/graminoid species with woody plants located along the bank. There is little to no overhanging vegetation to ameliorate instream water temperatures. The RGCP supports a fish community of at least 22 species including channel catfish, white crappie, bluegill, common carp, river carpsucker, smallmouth buffalo, gizzard shad, black bullhead, flathead catfish, largemouth bass, warmouth, green sunfish, and longear sunfish (Sublette *et al.* 1990).

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